RESEARCH NOTE LS-24

LAKE STATES FOREST EXPERIMENT STATION • U.S. DEPARTMENT OF AGRICULTURE

Healing Time for Pruning Wounds in a Red Pine Plantation

In red pine plantations the branches are persistent, and little knot-free lumber will be produced in less than 80 years without artificial pruning. When applied judiciously in managed stands, pruning should be a profitable investment.

A pruning study on red pine was established in Lower Michigan in 1950, and the effect of pruning on height and diameter growth was reported by Slabaugh.[1] This Note describes the effect of pruning date and other characteristics on the healing time of pruning wounds from that same study.

The test was established in a 14-year-old red pine plantation on a good site in Lower Michigan. Trees were pruned on July 27, September 25, and November 13 of 1950; and on April 5, May 4, May 21, and July 31 of 1951. The trees, which averaged 3.4 inches d.b.h. and 16 feet tall, were pruned to a height of 6 to 8 feet, using a hand saw. All the branches were alive when pruned.

On trees pruned on the first six dates, pruning wounds from whorls at heights of 3.0 and 4.5 feet averaged 0.84 inch in diameter in July 1951. Most wounds were covered with pitch, but only those pruned on April 5 or before showed much evidence of healing at this time. In October 1953, two growing seasons after pruning, the wounds had begun to heal and averaged only 0.5 inch in diameter.

In April 1961, ten growing seasons after pruning, three sample trees pruned on each of the seven pruning dates were felled, and all the knots in the two sample whorls were cut open in transverse sections to determine the manner in which the annual rings grew over the wounds. Wound width just after pruning, branch stub length, and radial growth of the bole during the 10 years after pruning were measured to the nearest 0.05 inch on 183 sections and averaged 0.80, 0.28, and 1.06 inches respectively. About one-third of the wounds had not yet completely healed; their healing times, on the basis of present unhealed width and growth rate, were estimated and averaged 13 years. For all wounds the average number of years before clear wood was produced, as determined by a ring count, was 9.7 years. These data were used to compute an equation for predicting wound healing time. The equation is:

$$Y = 11.115 + 4.380X_1 + 14.279X_2 - 8.382X_3$$

where Y = years before clear wood is produced

X_1 = wound width (inches)

X_2 = stub length (inches)

X_3 = radial growth during the 10-year period after pruning (inches)

Each of the independent variables was highly significant (.01 level). Radial growth accounted for a third of the variation in healing time while the three factors combined accounted for half the variation. Predicted healing times, based on the measured values of the three independent variables, were determined for all the wounds. The difference in healing times between pruning dates was not

[1] *Slabaugh, Paul E. Effects of live crown removal on the growth of red pine. Jour. Forestry 55: 904-906, illus. 1957.*

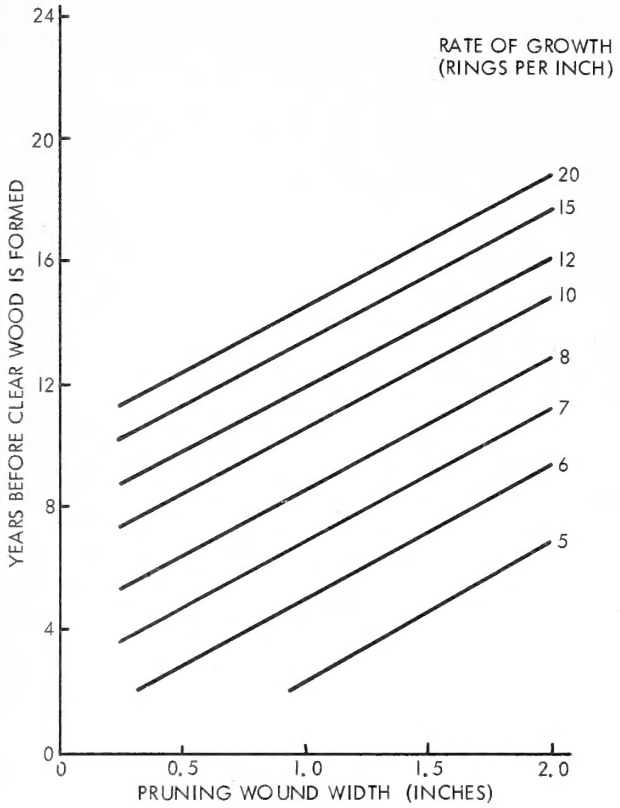

FIGURE 1. — Relationship between pruning wound width, bole radial growth, and time until clear wood is formed in a red pine plantation (branch stub length constant at 0.25 inch).

significant when the residuals were tested by analysis of variance.

In this study the branch stub length was measured from the cambium. Branches cut flush with the bark had a stub length equal to the bark thickness or about 0.25 inch. Increasing the average stub length another 0.25 inch would have increased the healing time 3.6 years, but increasing the wound width 0.25 inch would have increased the healing time only 1.1 years. For rapid wound healing, therefore, the branch stubs should be short, even though the wound width is increased slightly.

A series of regressions to show the relationship of wound width and growth rate to healing time was computed from the equation above. These regressions (fig. 1) show the importance of growth rate on healing time. A 1-inch-wide pruning wound, for example, was healed in 7 years where the growth after pruning was 7 rings per inch, but 12 years were required where the growth was 12 rings per inch. Thus, for the early formation of clear wood over pruning wounds the trees had to grow fast.

As a rule of thumb, the wounds of average width were usually healed when a layer of wood about as thick as the width of the wound had been formed. The thickness of the layer required was slightly less than the wound width for the larger wounds and more than the wound width for the smaller wounds. Thinning pruned plantations will stimulate diameter growth on the remaining trees, thereby reducing the time required to heal the pruning wounds and increasing the return on the investment in pruning costs.

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